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AB-39 - Paper**ARE EXAM SCORES AND OTHER ADVANCEMENT
SYSTEM COMPONENTS RELATED TO NAVY
DUTY STATUS?****Darlene Barrow, Robert Doucette, and Dr. J. Michael Lentz**

This presentation will compare the major Navy Duty Status categories on the basis of their exam scores and other advancement system components. The major Duty Status groups include, Inactive Duty Reservists, active duty Canvasser/Recruiters, active duty Training and Administration of Reserves, and regular Active Duty. Exam performance comparisons will be based on the same rating exams. Other advancement system components (award points and performance marks) will also be compared. A discussion of these results and their implications for different paygrades (E-4/5/6/7) will be presented.

The Naval Enlisted Advancement System (NEAS) scores exams and advances E-4 candidates in three different duty groups and E-5 through E-7 candidates in four different duty groups, to the next higher paygrade. These four groups have different type assignments:

- a. **Inactive duty Reservists (IR) personnel** - sailors who work in their rate that have training time and facility limitations, and are assigned to a training site relative to the sailor's location
- b. **Active duty Canvasser/Recruiters (CVR) personnel** - sailors on temporary assignment that recruit people for enlistment instead of working in their rate
- c. **Active duty Training and Administration of Reserves (TAR) personnel** - sailors on continuous assignment that provide training support to naval reservists
- d. **Regular Active duty (USN/R) personnel** - sailors on continuous assignment who work in their rate

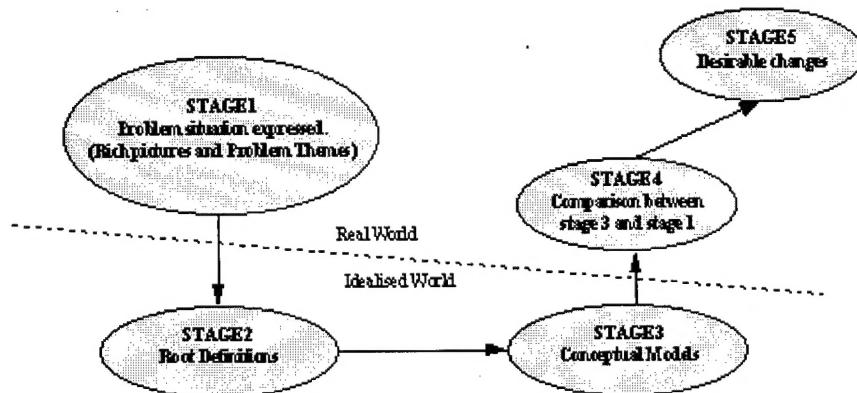
Active duty Naval Enlisted Advancement candidates for E-4 groups (c) and (d) and E-5 through E-7 groups (b), (c), and (d) participate in the same rating exams on scheduled paygrade dates. IR candidates take the same rating exams as active duty candidates, but at a later date.

Figure 1. shows the raw score (RS) to standard score (SS) conversion model used by NEAS for a 150 item test. The IR candidates utilize the same exam rate raw score to standard score conversion file established by the Active Duty candidates.

Raw score pass points for a four-choice 150 item test are derived using the binomial distribution, where $n/4 = (150)/4 = 38$ is the mean and $(npq)^{1/2} = [(150)(0.25)(0.75)]^{1/2} =$

5 is the standard deviation. The raw score cut point by paygrade is

$$\begin{array}{ll}
 \text{E-4} & \mu + ? = 38 + 5 = 43 \\
 \text{E-5} & \mu + 2? = 38 + 10 = 48 \\
 \text{E-6/7} & \mu + 3? = 38 + 15 = 53
 \end{array}$$



For our purpose, past rating exams for paygrades E-4/5/6 (Series 156) and for paygrade E-7 (Series 154) were used for

analysis. Table 1. shows the relationship between the Active Duty and IR administration dates.

TABLE 1. ADMINISTRATION DATES

Exam Paygrade	Series	Active Duty Exam Date	IR Exam Date
E-4/5/6	156	9-97	2-98
E-7	154	1-97	2-98

For the duty groups by paygrade, we hypothesize the following:

- (a) H_0 : There are no differences in exam Standard Score (SS) means.
- (b) H_0 : There are no differences in exam SS means for advanced candidates.
- (c) H_0 : There are no differences in Performance Mark (PMK) means.
- (d) H_0 : There are no differences in Award point (AWD) means.

METHOD

One-way Analysis of Variance tests were conducted to determine if there were any significant differences between group means for each null hypothesis. SPSS (Statistical Package for the Social Sciences) was used to analyze the data. For each null hypothesis that was rejected by the analysis of variance procedure, SPSS Bonferroni multiple comparison post hoc tests were applied between each set of means.

RESULTS

All four null hypotheses were rejected for all paygrades. Significant differences between duty group means are shown in Tables 2 through 5.

TABLE 2. STANDARD SCORE STATS FOR TOTAL CANDIDATES

E-4	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	586	43.6	9.8				

CVR	--	--	--				
TAR	522	53.1	9.6	**			
USN/R	23883	49.9	10.0	**		**	
Total	24991	49.8	10.0				
E-5	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	5153	40.6	9.2				
CVR	12	41.5	8.0				
TAR	1144	48.3	9.3	**			
USN/R	45538	50.0	10.0	**	*	**	
Total	51847	49.0	10.3				
E-6	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	8151	38.2	9.6				
CVR	104	38.7	9.0				
TAR	2380	45.7	9.6	**	**		
USN/R	38022	50.0	10.0	**	**	**	
Total	48657	47.8	10.9				
E-7	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	6959	38.4	9.9				
CVR	105	33.0	8.7	**			
TAR	2684	45.6	10.1	**	**		
USN/R	38580	50.0	9.9	**	**	**	
Total	48328	48.0	10.7				

NOTE: * (p < 0.05) and ** (p < 0.01) indicates significant differences which are shown

in the lower triangle.

TABLE 3. STANDARD SCORE STATS FOR ADVANCED CANDIDATES

E-4	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	528	44.5	9.5				
CVR	--	--	--				
TAR	406	55.2	8.8	**			
USN/R	10803	55.4	9.2	**			
Total	11737	54.9	9.5				
E-5	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	737	47.6	9.1				
CVR	9	43.8	7.9				
TAR	332	54.5	8.4	**	**		
USN/R	6594	60.7	7.9	**	**	**	
Total	7672	59.2	9.0				
E-6	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	458	48.4	9.1				
CVR	4	52.5	9.7				
TAR	223	57.8	8.4	**			
USN/R	2894	63.5	7.0	**	*	**	
Total	3579	61.2	9.0				
E-7	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	603	44.6	8.8				

CVR	2	48.0	8.5				
TAR	184	55.0	8.3	**			
USN/R	2805	57.7	7.3	**		**	
Total	3594	55.4	9.0				

NOTE: * ($p < 0.05$) and ** ($p < 0.01$) indicates significant differences which are shown in the lower triangle

TABLE 4. PERFORMANCE MARK STATS FOR TOTAL CANDIDATES

E-4	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	584	3.645	0.139				
CVR	--	--	--				
TAR	522	3.710	0.158	**			
USN/R	23881	3.712	0.156	**			
Total	24987	3.710	0.156				
E-5	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	5144	3.688	0.139				
CVR	12	3.642	0.100				
TAR	1144	3.733	0.157	**			
USN/R	45536	3.731	0.146	**			
Total	51836	3.727	0.146				
E-6	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	8140	3.779	0.132				
CVR	104	3.745	0.139	**			
TAR	2378	3.839	0.114	**	**		

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USN/R	38017	3.844		**	**		
Total		0.118					
E-7	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	6948	3.833	0.120				
CVR	105	3.871	0.067				
TAR	2682	3.930	0.064				
USN/R	38576	3.929	0.070				
Total	48311	3.915	0.086				

NOTE: (p < 0.05) and ** (p < 0.01) indicates significant differences which are shown in the lower triangle.

TABLE 5. AWARD STATS FOR TOTAL CANDIDATES

E-4	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	586	0.9	1.3				
CVR	--	--	--				
TAR	522	0.1	0.5	**			
USN/R	23883	0.4	0.9	**		**	
Total	24991	0.4	0.9				
E-5	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	5153	2.3	1.9				
CVR	12	2.3	1.9				
TAR	1144	1.9	1.7	**			
USN/R	45538	2.4	2.0	**		**	
Total	51847	2.4	2.0				
E-6	Count	Mean	Standard Deviation	IR	CVR	TAR	USN/R
IR	8151	5.3	2.6				
CVR	104	7.3	3.2	**			
TAR	2380	6.7	2.7	**			
USN/R	38022	7.5	2.7	**		**	
Total	48657	7.1	2.8				

NOTE: ** (p < 0.01) indicates significant differences which are shown in the lower triangle.

DISCUSSION

Of considerable interest and concern is percent of candidates failing their enlisted advancement exam. (Refer to Table 6.) The USN/R and TAR groups have relatively low fail ratios, 5.14% or less. The CVR fail percents of 25 to 39 are alarming. The very significant loss of professional rating knowledge associated with a brief 2 to 3 year recruiting tour needs further investigation. Of the IR duty group, the E-4 exam candidates have a relatively low fail ratio, 4.61%. However, the IR fail percent dramatically increases as paygrade increases. By comparison, the USN/R and TAR groups have only a modest increase in fail ratios with increasing paygrade. The mean exam standard scores are in general congruence with the 'fail' data.

TABLE 6. PERCENT FAILS BY DUTY GROUP

	IR	CVR	TAR	USN/R
E-4	4.61	--	0.19	1.97
E-5	16.77	25.00	2.27	3.01
E-6	28.99	25.96	5.13	3.43
E-7	22.00	39.05	5.14	3.36

CONCLUSIONS

It is possible that with the progressive passage of time plus very limited exposure to their navy rating, IR and CVR sailors lose much of their functional knowledge. The data seem to suggest that reservists and canvasser/recruiters need a more active continuing education program.

It should be pointed out that sample size by paygrade for the CVR group is small. The average exam performance of the CVR and IR duty groups are low and are of concern. From the perspective of test design, the standard score results are encouraging. The exams are not intended to be 'book tests.' Instead, our goal has always been to test actual on-the-job working knowledge and experience. The results suggest that sailors working everyday in their profession (rate) are on average performing much better than those that do not.

Although there are some statistically significant differences in performance marks (evaluations) between groups, there is little functional significance to these differences.

In a similar vein, the award point comparisons show significant differences in some means between groups at paygrades E-4 and E-5. However, these differences coupled

with the low variability in each group are not considered to be substantial for the award component. But, at paygrade E-6, the IR award point mean is significantly less than each of the other duty groups. The magnitude of these differences together with each group's variability are considered to be substantial for the award component.

The results of this study suggest that all three measures, exam standard score, performance mark, and award points, are related to navy duty group status. On the average, sailors (USN/R and TAR) with continuous training and facility access perform better than sailors (IR and CVR) with limited facility access and training time (full-time civilian job or recruiting full-time).

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Navy Advancement Center Dept
Dr. Grover Diesel, (850) 452-1815
6490 Saufley Field Road
Pensacola, FL 32509-5237

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